

## Buffelgrass and Sonoran Desert Tortoises

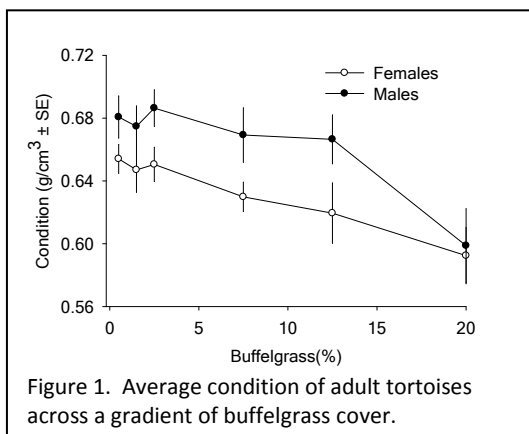
Invasions by nonnative species threaten biodiversity worldwide and have implication for 50% of endangered species in the U. S. Invasions by nonnative grasses are especially widespread and can alter ecosystems structure and processes, especially fire. Buffelgrass (*Pennisetum ciliare*), a perennial bunchgrass native to Africa and Asia, was introduced to the southwestern U. S. in the 1930's and has invaded southwestern deserts, creating a dense grass layer in areas where ground cover was sparse historically. Buffelgrass can exclude native plants and eliminate species that provide food and cover for native herbivores. In addition, areas invaded by buffelgrass have much higher biomass than native deserts, which will increase the frequency and intensity of fires.



Sonoran desert tortoises (*Gopherus morafkai*) occur throughout southern Arizona and northern Mexico, a region where the distribution of buffelgrass has increased markedly in recent years. Changes in vegetation in areas invaded by buffelgrass have potential to affect tortoises by reducing the distribution and abundance of their native forage plants and by increasing mortality rates by supporting fires, which are rare in the Sonoran Desert.

We studied effects of buffelgrass on tortoises in the Rincon and Tucson Mountain districts of Saguaro National Park in 2010 and 2011 by surveying tortoises and vegetation on 50 plots 200-x-200-m plots established in areas with different degrees of buffelgrass invasion (0-25% cover). We surveyed tortoises on each plot 4 times between early July and October, estimated density of tortoises on each plot, and measured the physical condition (mass/volume) of each tortoise.

We detected tortoises on 45 of 50 plots (90%) and one or more tortoises during 114 of 200 surveys (57%). We detected an average of 3.6 tortoises per plot, with a range of 0-12 tortoises per plot. We located 155 individual tortoises, 131 adults (62 females, 69 males) and 24 juveniles.



Density of tortoises averaged 0.33 tortoises/ha and did not vary with the amount of buffelgrass cover. Physical condition of tortoises, however, decreased as cover of buffelgrass increased (Fig. 1), averaging 10% lower in areas with >15% cover of buffelgrass compared to areas with no buffelgrass. Decreases in body condition could be a result of reductions in the quantity of plants that provide forage for tortoises, which we found to be reduced in areas invaded by buffelgrass. Continued declines in condition of tortoises could compromise their immune systems, lower reproduction, lower growth rates, and ultimately increase mortality. Because tortoises are long-lived and site tenacious, changes in plant community composition in response to buffelgrass invasion are unlikely to cause mortality or to trigger abandonment, which could explain why density of tortoises did not vary across the gradient of buffelgrass we studied.

If tortoises persist in areas invaded by buffelgrass, they likely will be exposed to more frequent wildfires that can cause high mortality. For example, up to 11% of a tortoise population was thought to have perished from the 1994 Mother's Day fire in the Rincon Mountains of Saguaro National Park. Wildfires might also perpetuate the spread of buffelgrass, as it thrives in post-fire conditions whereas other native Sonoran desert vegetation does not.

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